The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XLIX
No. 1276

SATURDAY, DECEMBER 11, 1943
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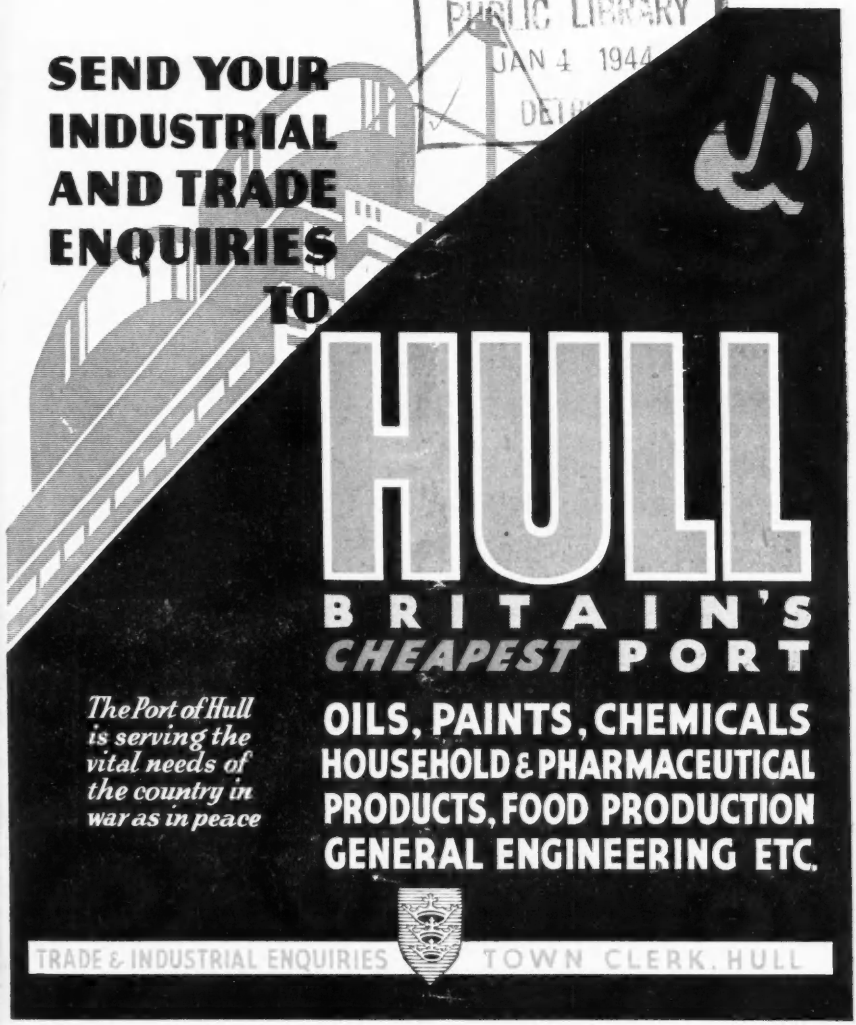
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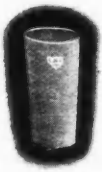

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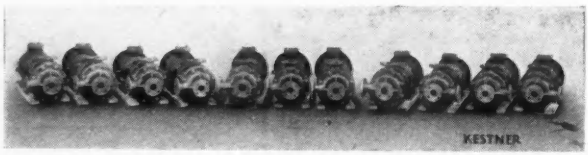

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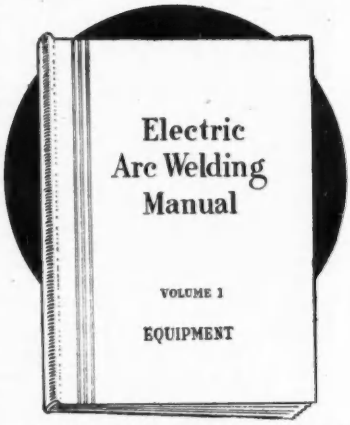

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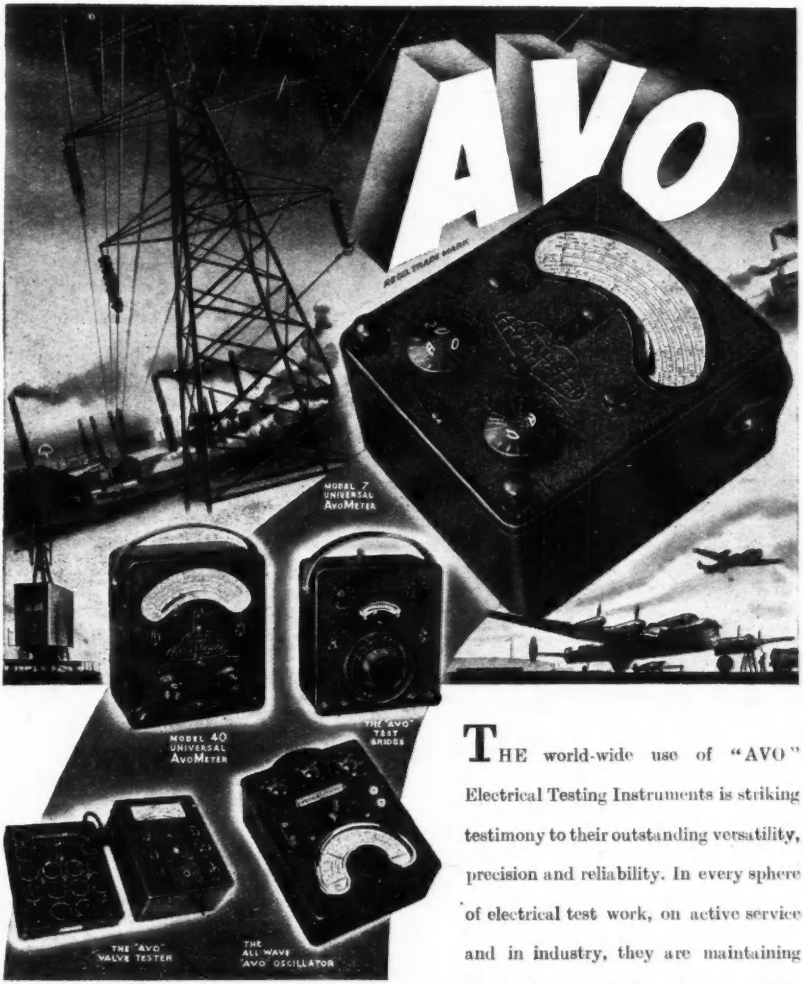

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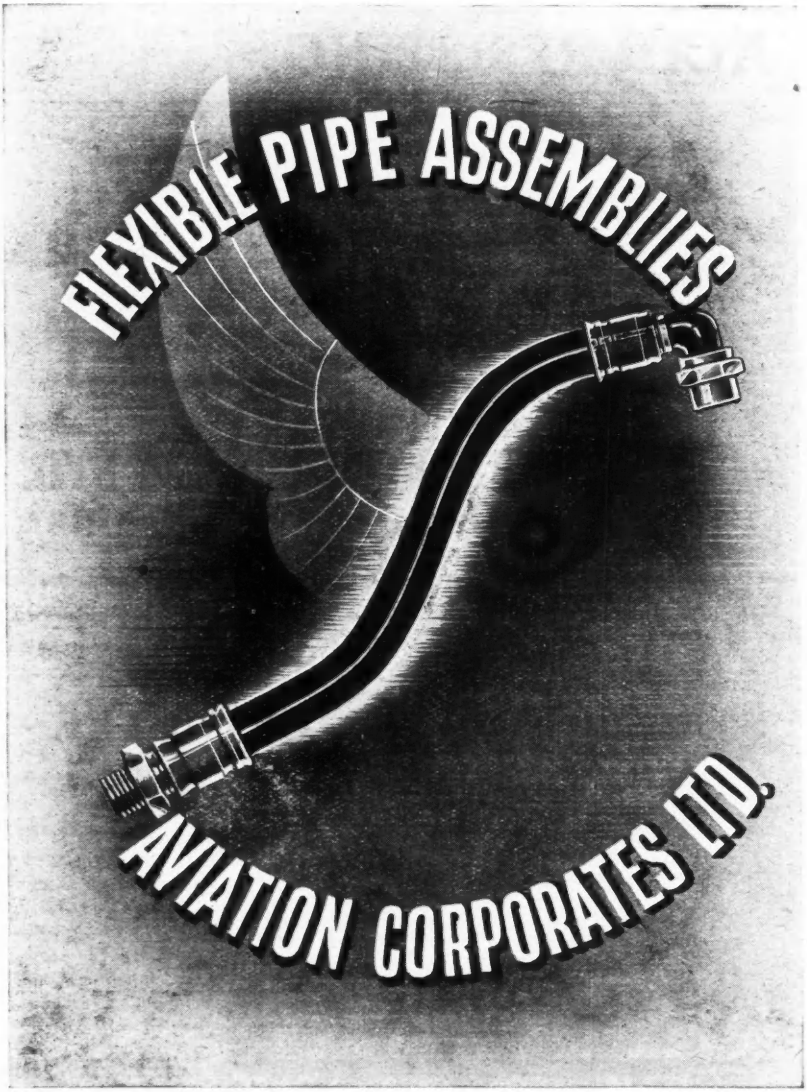

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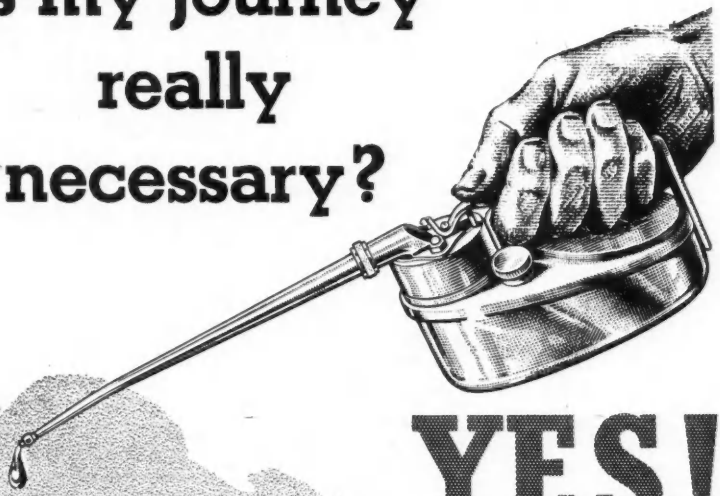

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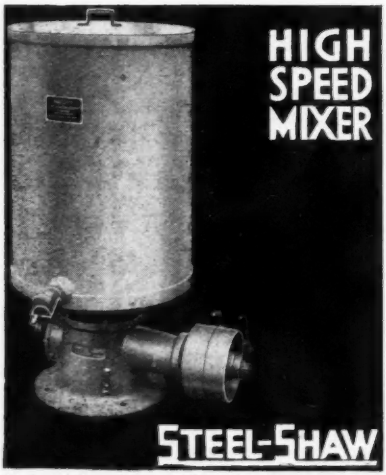

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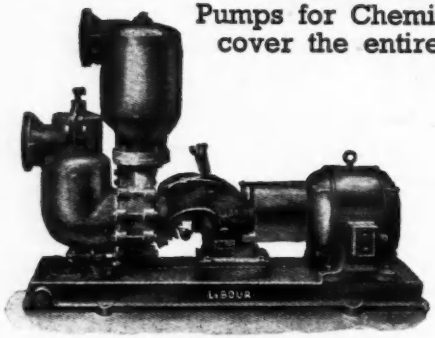

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VOL. XLIX
No. 1276

December 11, 1943

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Physical Reconstruction

THE appointment of Lord Woolton as Minister for Reconstruction is a highly important and significant event. It indicates that the Government now sees the end of the war sufficiently near to take thought for what is to happen when the dawn breaks. Will it be a dawn bright with promise or the hopeless dawn of the famous picture? This will depend on how we meet the situation in advance, and it is not surprising that Lord Woolton has expressed himself as diffident in undertaking his task. We and all industrialists wish him well, and we can guarantee that he will receive all the help that industry can give him. Some of the considerations which must be borne in mind in reconstructing our industries were discussed in our issue of last week. There is another important aspect of reconstruction now to be reviewed.

In examining post-war reconstruction several aspects are generally considered, such as town and country planning and the change-over of industry from war to peace. It seems to be generally assumed in most public discussions that if we decide to build, say, a million houses, a million houses will be built, and all that is necessary for complete success is that they shall be designed by an architect on modern and labour-saving lines. Those, however, who have had experience of the buildings erected during the last 25 years will be struck by the fact that they are very inferior in quality to those built 40 years ago. The necessity for building quickly may have been one cause of the deterioration, but it is more probable that it was the rise in costs that caused it, coupled with the unregulated licence of builders to put up any sort of houses which they believed themselves able to sell. The result of the rising prices was that houses cost some £2000 which before the war could have been built for one-third of the money. They were more modern in design it is true, cellar, kitchen, and attics being eliminated, but that is the only point in their favour, and most of those who have had the misfortune to live in houses of the 1920 - 1940 period know to their cost the very considerable sums that have to be spent in upkeep.

A serious defect in all houses, including many of the older ones, was the complete lack of attention given to heat conservation. In the older houses this did not matter very much because the walls were thick and to a great extent served as their own insulation. When

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the walls were made thinner the absence of any form of heat insulation immediately became apparent. There is no possible doubt that a very great deal of improvement could be made if a fuel technologist abetted the architect in the design of post-war houses. Those who are interested in pursuing this subject are recommended to read a very interesting bulletin, issued by the Ministry of Fuel and Power, called "Thermal Insulation of Buildings" (Fuel Efficiency Bulletin No. 12). Its subject is particularly important in view of the necessity for conserving our coal resources. If British houses and buildings generally were designed with a view to heat conservation it would be possible either to obtain the present limited degree of comfort with about one-half to two-thirds of the present cost, or, alternatively, to spend more on fuel and to be much more comfortable. Certain standards of construction, materials, and design can no doubt be laid down by Government committees for the guidance of local authorities, and it would thus be possible to prevent jerry-building. It would also no doubt be desirable to restrict the amount of profit that a builder could make on a given type of house. But when all has been done that is possible by legislation it is still clear that the cost of houses built after this war with the type of materials and general standards ruling before the last war would be impossibly expensive for the great proportion of the population.

There is a clear need for intensive research into the materials of building. New materials have been developed—plastics, glass, ceramics, and metals, all can play a part. There is need for research into the physics of building design and into the best materials to use for given purposes and into the manufacture of the materials. There has been an insidious infiltration of ideas from America which is foreign to British practice and which should be checked forthwith. It is all very well to consider that industrial plant should only be built to last for a limited time because changes in practice often render a plant obsolete before it is worn out. A building such as a house, on the other hand, if it is well designed and comfortable, will retain its original value for many decades. The practice of building houses to last 20 years only has been introduced into the U.S.A. There is a certain restless type of mind which perhaps enjoys having its house perpetually pulled down and rebuilt; but in conservative Britain, where people are still living in houses built in the days of the Tudors, this method seems out of keeping. We want our houses built well and solidly so that the annual expense on upkeep is a minimum and the comfort and convenience a maximum.

Here is a very wide field for research; a field which, we suggest, has not had the attention given to it that it deserves. The Building Research Station has done a good deal of useful work, and we have no doubt that in its records are the answers to a great many of the problems which will be put by those in charge of post-war reconstruction. It seems unlikely, however, that anything like the last word has been said on this subject. It is, moreover, notorious that faster progress in practical application is generally made by industrial research than by Government research organisations. There is on all sides a very considerable demand for much greater expenditure on research. We would plead here for an extension of the research facilities on building and building materials. There is ample room for both physical and chemical research, as has been indicated. A good deal of useful work in keeping alive the scientific side of building has been done by the Building Group of the Society of Chemical Industry. It is one of the disadvantages of the present publication arrangements of the Society that adequate publicity, in our view, is not given to the papers and discussions which take place before the constituent groups of the Society. The Chemical Engineering Group, which publishes its own transactions, is a model to the others, but, so far as we are aware, the Building Group does not publish its own transactions. Anyone who has attended the discussions and meetings of that Group, however, will have been struck by the high scientific and technical plane on which the problems are discussed. We mention this to indicate that there is a nucleus of scientific and technical men to cope with the problems of building. That nucleus could be made the basis of a very considerable additional organisation for building research.

NOTES AND COMMENTS

Centre of Science

SCIENTISTS, like Uriah Heep, have been and still are "very 'umble." Too humble, we might well say. One result of the modesty with which they stake their claims is that the space available in London for the conduct of the day-to-day business and the meetings of our scientific societies is out of all proportion to the importance of these bodies. We feel sure therefore that the world of science will give every support to the demand that Sir Henry Dale, the president of the Royal Society, made last week for a national centre of science. This centre, he said, should be big enough to permit our societies "to co-ordinate their activities with economy and give room for change, expansion, and organic growth." To show how cramped are the present quarters at Burlington House, he instanced the plight of the Chemical Society, which had originally to be satisfied with the poorest allotment of rooms and which had since undergone the greatest expansion. In the 1860's the Chemical Society had a membership of some 450; it now has about 5000. Its library, of great importance to all chemists, has so burst the bounds of its accommodation that a part of it is deposited in the crypt of a neighbouring church. Sir Henry Dale does not exaggerate when he says that the Society's meeting room is in every way unsuitable and inadequate to the meanest conception of the regular needs of a society of its standing and numbers. He thinks that scientists have the right to expect a national centre to be included in the plans for rebuilding London, and that this home of science should have a dignity symbolising the value of science to the nation and the empire.

Chemists and Food

THE lecture which Professor J. C. Drummond, scientific adviser to the Ministry of Food, gave to the Royal Institution last week had a double interest to the chemical industry. First, because he showed the way chemists are helping to define more exactly the constitution of a diet that will be complete from the physiological point of view, and, secondly, because he stressed the urgent need for research to discover what are the best diets for industrial workers. To define a diet in terms of bulked carbohydrates, fats, and proteins is outmoded, even though allowances have been made for the necessary rations of vitamins and mineral salts. Indeed, it is fair to say that our present knowledge of vitamin requirements is more exact than our knowledge of protein requirements. Readers will recall no doubt the disastrous feeding experiment made many years ago in a French hospital when gelatine was substituted for meat in the belief that any source of protein would meet the biochemical needs of the human body. Gelatine did not contain the requisite amino-acids, and the fatal results of that experiment proved that proteins would require a great deal more investigation before protein requirements could be stated with scientific precision. Thousands of researches in this field have been carried out during the last half-century. Proteins have been broken down into amino-acids and to-day it is known that at least eight of these amino-acids must be included in the diet, although the human body can synthesise certain others. It is still not possible, however, to set out a daily diet sheet in terms of the minimum weights of tryptophane, lysine, leucine, etc., that a man must ingest each day if he is to remain healthy. Here, then, is a gap that must be filled by research.

Industrial Diet Research

PROFESSOR DRUMMOND also commented on our present state of ignorance with regard to the dietary requirements of industrial workers. We do not know yet what diet will maintain the body of the worker in a steel foundry, a soap factory or a sulphuric-acid plant at its highest efficiency. At present our bodily instincts, coupled with the accumulated experience of previous generations, guide us to diets that are physiologically adequate. For instance, the snacks eaten between main meals by nearly every kind of worker exemplify the soundness of those dietetic instincts. If one examines what a heavy industrial worker considers a snack one finds that it consists of a carbohydrate meal con-

taining a relatively enormous amount of energy—anything up to 600 calories, in fact. The heavy worker is thus meeting his energy needs with unconscious and uncanny accuracy. The athlete achieves a similar result by taking sugar, but it is a matter for reflection that whereas the energy requirements of athletes have been worked out scientifically, no similar investigations have been made of the performance of industrial workers. Here, surely, is a problem that the various industries could investigate for themselves. There is no need to leave such urgently-needed research in abeyance until the Medical Research Council or any other appropriate official body can find the time and the resources to initiate it.

Plastics and the Engineer

WE commend to the attention of our readers the lecture which the superintendent of the Engineering Department of the National Physical Laboratory, Dr. S. Livingston Smith, gave yesterday to the Institution of Mechanical Engineers. He presented a valuable survey of plastics from the mechanical engineer's viewpoint, and this will be published in full in the institution's journal. It provides a valuable antidote to the most serious disease of the plastics industry, the symptoms of which are the cheap ash trays and cheap torch batteries that prove too weak even for the negligible strains and stresses to which they are subject. The plastics industry is inclined to waste valuable energy in castigating the lay Press for making too many extravagant claims for plastics. It would do better to ensure, by means of codified standards, that those manufacturers who are to-day producing the shoddiest type of plastic substitutes are run out of business. We feel sure that reputable manufacturers of plastics, as well as the chemists who created this important new industry, will agree with Dr. Smith's contentions. As a mechanical engineer, Dr. Smith divides plastic products into two rough groups. The attractiveness of the first is primarily ease of production of large quantities of insulating, non-corroding components, light in weight, but of no great strength. The second group, the reinforced plastics and laminated woods, in addition to being light and non-corroding, offer possibilities of considerable saving in weight. Much emphasis has been placed on this latter group inasmuch as weight-saving is an important consideration for transport, as also in those stationary structures whose main strength is necessary to carry their own weight. There will be general support for Dr. Smith's statement that much more research will be necessary to enable the full strength of fibres to be employed, to improve serviceability, and to facilitate cheap and easy production of small quantities. Engineers and chemists must play a full and equal part in such research, on the lines of the happy collaboration which exists between the Chemical Research Laboratory and the Engineering Department of the National Physical Laboratory.

Sulphonamides in America

CONTINUED publicity is being given in the United States to what are known, in that country, as the "sulfa drugs." The slightly feverish air with which these excellent products are being "put over," may perhaps be due to an unfortunate mishap, of comparatively recent date, in the manner of their distribution to the public, with disastrous results that may well have created a certain amount of hostile prejudice. The latest of the products to be made generally available is known as sulphamerazine, which is claimed to be no more toxic than sulphadiazine and equally efficient in smaller doses, owing to its longer retention within the system and its more complete absorption. It is said to be effective against haemolytic streptococci, meningococci, pneumococci, and gonococci. Meanwhile, Mr. Paul Goedrich, of Rutgers University, Newark, N.J., announces the discovery of new sulphaiodine compounds which destroy spores in cultures of tetanus, gangrene, and anthrax. In a paper to the American Pharmaceutical Association he reports that two additional extracts were obtained from the original sulphaiodine compound, which, although containing no iodine, revealed the iodine activity in killing germs in cultures of various organisms. The extensive claim is made for these new compounds that they are effective against all types of organism.

Chemical Products of Gas and Coke

A Great Future for a Great Industry

by FRITZ FRANK, Dr.Phil.

IN its Report on "The Planning of the Gas Industry,"[1] the British Gas Federation deals very thoroughly with the importance, possibility and necessity for promoting the gas industry both from the economical, technological and chemical points of view. In THE CHEMICAL AGE[2] this Report is commented upon very fully, and, following the line of thought expressed therein, it refers to doubling the present output of the gas industry. In the *Journal of the Institute of Fuel* last February[3] T. A. Tomlinson even suggests that in order to justify economic interests (which also include chemical interests), gas production should be trebled. This same subject is the theme of a whole series of other works and lectures, of which those by Col. W. A. Bristow[4] deserve mention from the standpoint of the chemical treatment of coal.

Coal as Raw Material

All these studies, in my opinion, are homogeneous and economically commensurate with the measures adopted in the chemical development of the American petroleum industry, and those which are being followed here wherever possibilities for treating imported crude petroleum exist. From the purely chemical standpoint, therefore, as well as from the technical, the importance of both industries as regards economic location may be regarded as equal. For this reason it is of particular value that Dr. Dunstan should have dealt so fully with the chemical treatment of petroleum in the *Journal of the Institute of Petroleum*[5] for July this year. The vital importance of coal as a chemical raw material as well as a source of power, as recognised on the Continent and equally in the U.S.A., is greatly emphasised by Col. W. C. Devereux in a pamphlet this year entitled "Post-War Reconstruction of Industry in South Wales."[6] The British Coal Utilisation Research Association is also pursuing many of the problems associated with chemical and technical treatment and utilisation, including that of general domestic heating, and has guided its activities into favourable channels.[7]

Since I am dealing mainly with the chemical problems of the products and by-products, I will refrain at this stage from going into the not too attractive economy of present-day coal usage, *e.g.*, in the domestic hearth. I shall, however, limit myself to saying that in the average household the consumption of gas for heating purposes is almost as uneconomic as the use of coal in the open grate. The precious thermal value of the gas appears to be mainly consumed purely for the luxury of ventilation, although there is one advantage in this luxurious use of gas as compared with coal, namely, that it does not cause air pollution to the extent that occurs with coal combustion, when tar vapours and flue gas and dust are formed. For a chemical technologist the contrast between the value of coal or heating gas and its waste by ventilation is, and remains, beyond comprehension.

Taking the statistical aspect as proposed in the British Gas Federation's Report and as outlined by T. A. Tomlinson, it may be taken that the consumption of coal by gasworks has hardly changed since 1913. In that year it amounted to 16,968,000 tons; in 1929 it was 17,019,000 tons; and in 1938, 18,200,000 tons.

Tar and Benzene

Nowadays, apart from gas for domestic and industrial purposes, considerable quantities of tar and benzene are produced from coal used in gasworks (according to Tomlinson equivalent to 105.1 million gallons of motor-spirit; according to the British Gas Federation equivalent to a little over 20 million gallons). The total gas production figure given in the Gas Federation Report is some 8,000 million cubic metres.

This quantity corresponds to about five times the amount of the gas supply delivered by the Ruhrgas A.G. in Germany in 1935, after chemical treatment. Only a portion of the Ruhrgas collieries participated in this output and only about one-seventh of the total gas was supplied to corporation gasworks, six-sevenths going to industrial undertakings. It was

in those very collieries which supplied gas to the Ruhrgas A.G. (the latter acting merely as retailers and distributors) that the industry of treating gases was particularly developed. The treatment of benzols and tar products was carried out in highly specialised joint undertakings such as the Teerverwertung G.m.b.H. Duisburg-Meiderich. In the physical and chemical treatment of gas, the Concordia plant at Oberhausen led the way by its adoption of the Bronn or alternatively the Bronn-Linde Process. Thus the difficulty of the coke/gas and tar/coke dilemmas was practically eliminated by the use of compound ovens and the introduction of the chemical industry.

Assuming a doubling or trebling of the possibilities indicated with regard to the working-up of coal into gas, the yield of products for treatment by the chemical industry could also be correspondingly multiplied; in fact, they could be increased yet further because concentration would facilitate the production of the by-products as a whole. A matter of vital interest to the national economy is the production of motor spirit, benzene, and its useful homologues and analogues.

Separation Methods

The problem of separating these valuable commodities from the gas has been solved so completely that very little need be said about it. Washing with oil, adsorption by active carbon or silica gel, separating by cooling and deep-cooling the gases* are the main courses which can always be pursued with certain modifications. Not one ounce of this material, so valuable to chemistry as well as to national economy, would be produced in vain. Other materials, normally regarded as contaminants, which must or could be washed out of the gas, are first and foremost the sulphur compounds which are present mostly in the form of sulphuretted hydrogen and carbon bisulphide. As far as possible these compounds are usually removed from the gas at the gasworks, and in the form of sulphuretted hydrogen they present a particularly valuable material for the production of sulphuric acid (*e.g.*, the Beckton Gasworks catalytic process), and —in larger plants—of pure sulphur*, provided that it does not pass into sulphocyanogen, etc., compounds.

The carbon bisulphide can be economically removed by normal methods, *e.g.*, with active carbon (produced in the by-product plant) and entirely by washing with aniline; in this way thio-carbanilide (a most valuable flotation agent and useful for various other purposes), etc., can be obtained. Other methods for removing carbon bisulphide are washing by the Methanol/Soda Process or the Polysulphide Process.* With regard to thio-carbanilide it became necessary about forty years ago in one special instance to remove all traces of carbon bisulphide from the gas of a large gasworks, and this was done by washing with aniline; the task was completed with 100 per cent. success. At that time this method of washing could be applied only to this particular case because it was not known how to dispose of thio-carbanilide in large quantities; this state of affairs, however, has now been somewhat changed.

Hydrocarbon Synthesis

The production of ammonia and cyanogen compounds from gas in large gasworks may be carried out on such a scale as to constitute a competition to the electro-chemical processes (Frank-Caro, Haber, Cyanamide Corporation, and others). In large central plants the seasonal and daily fluctuations will not greatly influence the normal coal throughput because large-scale plants are equipped for heating both with producer gas and with the ordinary gas generated in the plant. The gas (producer as well as ordinary gas) is used in the chemical plant, *i.e.*, the synthesis of ammonia and of the hydrocarbons built up from the unsaturated products and hydrogen by catalytic processes. Therefore, the treated gases are able to supply butadiene as well as all the other important hydrocarbon materials based on acetylene, ethylene, etc. The methane, pure or impure, is a valuable substitute for petrol and can be treated alternatively by cracking with catalysts. There are many available channels, and the outlet for the raw materials derived from gas fractionation for the synthesis of hydrocarbons, ammonia, etc., is unlimited and is likely to remain economic, especially as there is always an excess of small coke in such plants for the production of water-gas and

* In the Annual Report of the Ruhrgas A.G., 1935, it is stated that in the plant at Horst almost 7000 tons of pure ground sulphur were produced; almost the same output in the same period was achieved at Leuna.

its working-up into petrol substitutes, paraffin wax, diesel oil, and other chemicals and for heating the coal distilling ovens, etc., so that all hydrocarbons could be spared for chemical purposes. Apart from benzene and its homologues, a whole series of tar hydrocarbons are also available, which, where they cannot be made use of as chemical starting products, can always retain their full value as home-produced fuel-oil and petrol substitutes.

Purification by various convenient methods which have become well established (*e.g.*, washing with slightly dilute sulphuric acids, applying the Instil Process and others,[9] or any other equivalent method) has greatly helped to reduce the losses which constitute a great encumbrance to the tar industry, and to relieve the production costs of benzene. The inhibitors do not fulfil all requirements as yet, but certainly do something towards it.

If the production of coal-tar is increased, not only will the amount of phenols (essential for the synthetic resin industry) be raised by direct extraction from the tar products, but a considerable proportion of the increased yield of benzene can be converted into synthetic phenol which will thus become available to the highly important industries of synthetic resins, salicylic acid, etc. The larger the synthesis plants, the lower the expenses for obtaining phenols directly and synthetically. (The Raschig Synthetic Plant works with, I think, 1500 tons per annum at a good profit at the pre-war prices for phenol.)

If all the liquid homologues of benzene, boiling up to naphthalene—after the removal of the latter, and excepting toluene—are either used for motor-spirit alone, or are mixed with alcohol (partly methyl alcohol, partly higher homologues) and/or petrol which is imported, the octane numbers and thermal values of the alcohols as well as the anti-freezing properties of the spirits are increased.

Toluene Removal

The question as to how far toluene can appropriately be removed from motor-spirit has been replied to, after many years of experience, to the effect that toluene may be removed entirely without interference to the essential properties already indicated. For example, the distillation range of a mixture of 90 per cent. benzene and 10 per cent. xylene shows 85 per cent. at 100° C. and 95 per cent. at 120° C. In this case, it is, of course, essential to remove the gum-forming portions from the hydrocarbons boiling at or above 160° C. to the extent that they cannot interfere with the required uses; treated in this manner, all the liquid hydrocarbons coming within a distillation range up to 200° or 220° C., can be used as motor-spirit. If this precaution is not taken, it will be possible to use only the liquid distillates which boil up to a maximum of 160° C. They should be treated with a small amount of approximately 80 per cent. sulphuric acid, and blended with a suitable inhibitor, (*e.g.*, hydroquinone). The portions boiling above 160° C. can be used economically only after the resin-forming substances have been separated from the naphtha as resins. If this is not carried out, the inhibitors will not render sufficient service.

Production of Resins

Experiments carried out in America, Germany, and in several instances in this country, have shown that the refining of high-boiling naphtha can be performed economically in different ways. The separated gum-forming substances are high-grade resins. To attain special grades of resin, good fractionation must be carried out; the phenols (and nitriles forming benzoic acid, etc.) and bases have to be carefully removed. According to the latest statistics from America, over thirty million pounds of such resin products—the so-called coumarone resins—have been produced and consumed in the resin, lacquer, and rubber industries. Imports to Britain, though the figures are not available, must be considerable; they were certainly considerable as far as imports from Germany alone were concerned.

The re-distillation of these coumarone resins may also lead to an increase in the phenol yields, because, during the re-distillation (cracking), polymeric coumarone, for instance, splits into hydrocarbons, phenol, and cresols; in addition, ethylphenol is formed, but is present to a very small extent only. Among hydrocarbons, benzene, toluene, xylene, and hydrogenated hydrocarbons are formed during the splitting process, because during the de-polymerisation or cracking

a portion of the polymers is carbonised, while simultaneously the split-off hydrogen gives a hydrogenating reaction, (*e.g.*, hydrindene from indene).

As regards the tar oils and the pitch, the oils resulting from the treatment of the high- and low-temperature tars, which were used in peace time—in this country as well as abroad—for impregnating railway sleepers and as fuel-oils (though of little value in the latter case), will retain and be able to increase their value as fuel-oils for diesel motors[4] after the portions suitable for timber-impregnation have been separated and the phenolic products taken out and fully utilised in the interests of national economy. This is a matter which has been only partly solved; the remainder of the investigation constitutes a very interesting problem for the chemists of the future.

Use for Phenolic Products

The phenolic products removed from the tar oil by means of caustic soda or solvents for the purpose of obtaining good diesel oil offer good value in at least three directions: (a) as a high-grade disinfectant for veterinary or medical purposes, already tested on a large scale and with good success; (b) for the production of high-grade roofing-felts (not previously economic); and (c) for the manufacture of thermosetting resins. If, in addition, the basic substances are also removed, they will provide valuable material for veterinary practice,[10] quite apart from their chemical importance (isoquinoline, acridine, etc.).

The question of the remaining products is being ever more surely answered by chemical research[11] and they will provide many substitutes for hitherto imported commodities. They also provide some low-grade, but useful lubricating oil, and can produce higher grades by hydrogenation.

Pitch

The problem of the utilisation of pitch from tar is less importunate than formerly, when it was used for road-making, roofing-felt and heating purposes. In the first place, the pitch can be used instead of imported asphalt to standardise the coal and coal-briquettes being marketed,[12] and secondly, by carbonising the pitch—actually a cracking process (*e.g.*, the Knowles Process)—electrode coke and almost ashless producer-gas coke can be obtained in every useful quality. In fact, by a somewhat more complicated process (Adler Process, B.P. 517,802: "Improvements in and relating to the Distillation of Crude Oil Petroleum of Tars obtained from Coal and Shale"), a considerable portion of the activated carbon used in this country could be produced at fairly low cost. The waste liquors from tar distilleries and coking plants can be fully purified by this activated carbon; in this way huge quantities of phenols can be extracted from these waste liquors[13] and the exhausted carbon, polluted by impurities, can be re-activated in the actual plant itself.

Recovery in the Plant

In the process of purifying gas (separating the benzols and removal of CS_2) this work can now be done more economically by recovering the active carbon in the gas or tar plant itself. The distillation products arising during the production of the electrode coke are, to begin with, of interest to the rubber industry; normally, they are low-grade fuel-oils, but during a second process (producing the activated carbon) they can be converted into fairly useful diesel grades.

The home industry must reckon with the fact that the treatment of petroleum will form an exceedingly important link with the synthetic production of various materials and, in any consideration of a national coal policy, it should be worth while for the gas industry to tread the same path in harmony.

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American Industrial Alcohols

Some Recent Developments

FOLLOWING the article on "Ethanol and Butanol" in THE CHEMICAL AGE (Dec. 4, p. 551), readers will be interested in a paper* read by J. G. Park and T. R. Donlan, of the Standard Alcohol Co., New York, at the recent Detroit meeting of the American Chemical Society. The authors described how methyl alcohol is now being produced commercially in the U.S.A. by three different processes—one old and two relatively new. The oldest source is the crude wood alcohol produced during the destructive distillation of wood in the manufacture of charcoal. Approximately 6,000,000 gallons of methyl alcohol are obtained by this means. The output cannot be increased, however, since methyl alcohol thus made should be considered a by-product of charcoal which, in turn, is limited by the availability of proper hardwood, and suitable labour to cut and collect the timber. The value of the by-products obtained in the distillation of pyroligneous acid—namely, acetic acid, acetone, and methyl alcohol—becomes an asset to the operation if the price of and demand for charcoal justify the operation. If, however, there is insufficient demand for charcoal, the cost of the solvents must pay for both the timber and for the expense of their own distillation.

At present, as in the past, the two main outlets for wood alcohol are in anti-freeze blends and ethyl alcohol denaturants. The crude alcohol contains a number of impurities which impart a strong odour to the material and thus make it specially suitable for these purposes. An additional distillation is required to render it satisfactory for other uses. Wood-distillation methyl alcohol is in heavy demand at the present time, but the post-war position of this material will depend entirely on its ability to compete in cost of production with the synthetic product. As the manufacturing limitations of wood alcohol did not permit production to keep pace with demand, the manufacture of synthetic methyl alcohol, first prepared in the U.S.A. in 1923, has steadily increased in volume.

Synthetic Methanol Production

The two outstanding processes for producing synthetic methyl alcohol are at present limited by difficulties in obtaining critically needed material. As an instance, the process in which carbon monoxide is partially reduced by hydrogen requires a pressure of 200 atmospheres at 450° C. with a zinc oxide/chromic oxide catalyst. Since high-pressure equipment is practically unobtainable, this process cannot easily be expanded to-day. The second method, the catalytic oxidation of methane, requires 100 atmospheres pressure at 260° C. The methane is passed through copper tubes in a ratio of 9 parts methane to 1 of oxygen.

The chemical and physical properties of methyl alcohol make it an important product in industry. It finds extensive use as an industrial solvent for such products as wood stains, soaps, artificial leather, gums, celluloid cements, motor fuels, paint and varnish removers, shellac solutions, spirit varnishes, alcohol lamps, etc. In normal times the largest use is in anti-freeze blends. Maximum anti-freeze protection per gallon of the three water-soluble alcohols is given by methyl, and therefore it is probably the most economical to use. Data recently secured, however, tend to indicate that methyl alcohol loses sufficient volume in evaporation to reduce significantly its anti-freeze protection. The second major use for methyl alcohol is in the denaturing of ethyl alcohol. Both wood alcohol and a small amount of synthetic methyl alcohol are used for this purpose. It serves as a highly satisfactory denaturant owing to the difficulty in its separation from ethyl alcohol and the relative ease with which it can be detected.

Formaldehyde Preparation

Large quantities of synthetic methyl alcohol are used as the raw material in many chemical processes; the most important is the preparation of formaldehyde by mild oxidation of the alcohol. In recent years formaldehyde has become extremely important as a constituent of various synthetic resins, plastics, and explosive intermediates such as pentaerythritol. Heavy demands for explosives and other military requirements have resulted in a scarcity of methyl alcohol. Increased activity in certain plastics such as the methacrylates is also a contributing factor in the reduced availability.

Since synthetic methyl alcohol and ammonia are produced in the same type of equipment, increased production of methyl alcohol during the war period must necessarily be balanced by the military and agricultural requirements for ammonia. If the combined demand for these two products is in excess of the available supply, the least important civilian uses must be curtailed or replacement by less critical materials must be made. After the war, however, the demand for methyl alcohol through its chemical derivatives may be expected to increase. There will be sufficient excess ammonia equipment in the country, and synthetic methyl alcohol should be readily available

* *Ind. Eng. Chem.*, 1943, **35**, 10, p. 1030.

and in a favourable economic position. The basic cost for methyl alcohol should be figured in terms of ammonia, since the value of the former can be calculated directly in ammonia displacement.

Propyl Alcohols

n-Propyl alcohol was originally obtained from fusel oil. It is a constituent of the higher alcohol fraction in the production of synthetic methanol. The biggest market for the small amounts available is in its oxidation to propionic acid.

*Iso*propyl alcohol is prepared in substantially the same manner as synthetic ethyl alcohol, and became available commercially by this method in 1920; production figures have steadily increased. One of the largest present uses is the production of acetone and ketone by catalysis. Acetone can be made in this manner at a lower cost and probably in a purer form than that obtained by fermentation; the result is an increased demand for this product. Another large market for *iso*propyl alcohol is in anti-freeze compositions. In combination with methyl alcohol it produces a particularly satisfactory anti-freeze blend with properties not possessed by either alcohol alone.

As a result of war restrictions on the use of ethyl alcohol, *iso*propyl alcohol is now being employed as a satisfactory substitute in the toilet goods and cosmetic field. At present virtually all rubbing alcohol is made from *iso*propyl alcohol. Many other preparations such as after-shave lotions, toilet waters, etc., contain *iso*propyl alcohol. Certain types of perfume are now being blended with *iso*propyl alcohol as the carrying agent. The anhydrous grade displays solvency for certain essential oils in excess of that exhibited by the corresponding grade of ethyl alcohol. Since there has been a gradual improvement in the quality of *iso*propyl alcohol, through better manufacturing technique, perfumers are adjusting their blends to accommodate the new odour and improved solubility. It is believed that after the war many users will not return to ethyl alcohol. *Iso*propyl alcohol is contributing to the war effort in such uses as fuselage cleaners, de-icing fluids, plywood impregnating solutions, shackle lubricants, shock-absorber fluids, vitamin crystallisation, lacquer thinners, etc. Increasingly large amounts are also being consumed in preparing *iso*propyl acetate, a nitrocellulose solvent finding wider uses within the past few years.

Butyl Alcohols

Before the war *iso*butyl alcohol was obtained in large quantities as a by-product in the preparation of synthetic methyl alcohol. It exhibits reactions typical of the primary alcohols, except that the presence of a branched chain next to the carbinol group makes rearrangement unusually easy. An example is the reaction between *iso*butyl alcohol and hydrobromic acid to produce *tert*-butyl bromide rather than the *iso* compound. The commercial value of *iso*butyl alcohol is about halfway between normal and secondary butyl alcohol. Its use, therefore, has been limited largely to the production of the corresponding acetate, a satisfactory nitrocellulose solvent. *Iso*butyl alcohol has found some use as a lacquer co-solvent and as a constituent of brake fluids, combined with castor oil. It is understood, however, that major producers are now using it in special war work which may find a definite position in industry after the war.

sec-Butyl alcohol is becoming increasingly available, thanks to improved manufacturing facilities. It is produced in substantially the same manner as ethyl and *iso*propyl alcohols —*i.e.*, by hydrating the corresponding olefine. At present its two most important uses are in the preparation of *sec*-butyl acetate, an excellent intermediate-evaporating nitrocellulose solvent, and of methyl ethyl ketone obtained by dehydrogenation of the alcohol. Methyl ethyl ketone is a valuable solvent for vinyl resins, nitro-cotton, and synthetic rubber. In the anhydrous state it presents solvent properties equal to those of acetone. Its evaporation rate, however, is definitely slower than acetone, a fact responsible for its high initial blush resistance in lacquer formulations. After the war the demand for this material should continue to increase, as special resins and synthetic rubbers, upon which its use is somewhat dependent, will continue to expand. Its superior nitro-cotton solvency has been demonstrated. In this capacity it should replace ethyl and *iso*propyl acetates in many cases.

tert-Butyl alcohol is readily obtained from the hydration of *iso*butylene. In the pure state, however, it freezes at 25° C., a property rendering its commercial use somewhat limited. It is employed as an alkalating agent in the preparation of such compounds as *tert*-butylphenol.

Amyl Alcohols

Originally, amyl alcohols, both normal and *iso*, were obtained as by-products in the fermentation of grain. Little is apparently being produced at this time, probably owing to changes in manufacturing technique. The only additional amyl alcohol, other than that produced by chlorination, is *sec*-amyl alcohol. This material, prepared before the war by hydration of amylene, was used to make methyl *n*-propyl ketone, a dewaxing solvent. *sec*-Amyl acetate, derived from the alcohol, has found use in the lacquer trade. Amylene, the raw material from which *sec*-amyl alcohol was made, now possesses a greater war value than that of the alcohol itself. The production of the alcohol, therefore, has dropped to almost nothing.

War-time Research in Eire

Emergency Bureau's Achievements

BEFORE voting an additional sum of £10,850 for the Emergency Scientific Research Bureau of Eire (bringing the total provision for 1943 up to £32,850), the Dail heard from Mr. de Valera a full account of the bureau's activities. He referred to the success achieved in phosphorus and phosphorus sesquisulphide manufacture, and to a process which had been worked out for the recovery of sulphur from spent oxide, although economic and technical factors prevented the further development of the latter at present.

Also mentioned was the progress of Irish Alcohol Factories, Ltd., which has been successfully operating the plant designed for formalin production. High-quality pharmaceutical glycerine is being produced on a large scale by a commercial concern with the help of the bureau. As a sequel to experiments made under the bureau's auspices, arrangements have been made with commercial concerns for the erection of a plant that will produce the aluminium sulphate needed in paper manufacture. The technical aspects of ensuring certain medical supplies have been fully investigated. Digitalis from Irish-grown foxgloves has been standardised, and its large-scale manufacture undertaken by an Irish firm.

Government Collaboration

Methods of acetone production have been perfected, but these will be reserved for use in event of a fresh deterioration in the supply position. Activated charcoal has been produced on an experimental scale. The bureau continues to work in close collaboration with Government departments. Amongst the problems successfully investigated are the production of substitute wool oil, yeast from home materials, fatty acid for use in polish manufacture, and insecticide from offal tobacco. The Industry and Commerce Departments, in conjunction with the bureau, considered the manufacture of fish oil, but came to the conclusion that it could not be achieved at an economic price.

The Seaweed Survey has been taken over by another body, the Industrial Research Council. The bureau's work in connection with seaweeds was mainly concerned with finding a suitable substitute for agar-agar, and a commercial firm is now able to manufacture an agar of high quality.

A number of problems arising from the production of adhesives have been examined; these have concerned such materials as casein adhesives, rubber adhesives for boot manufacture, mucilage from waste carob seeds, and glue for match-making. A process for the manufacture of substitute insulating-tape has been developed and is now being worked commercially. Commercial firms are now operating processes developed by the bureau for the preparation of fly paper, and of an engraving glue substitute.

A considerable amount of work is in progress in connection with explosives, and preliminary work has been completed concerning chlorates. Tests are being made in order to produce an improved fertiliser from Clare phosphates. The bureau has also cooperated in large-scale experiments made by a commercial firm on the use of Avoca pyrites for sulphuric acid manufacture, and encouraging results have been obtained. The bureau has also produced lead oxide for use in batteries.

One of the bureau's earliest problems—the production of turf charcoal for producer-gas plants—has reached the stage at which the retort plant at Tarraun gives a weekly output of 14 tons of high grade charcoal. A new technique for the large-scale production of charcoal in pits and kilns has been evolved.

During the debate in the Dail questions were asked concerning the commercial firms with which the bureau was working. Deputy Larkin, junr., asked whether the results were to be handed over to private enterprise without return. Mr. de Valera explained that the bureau was an organisation which aimed at the rapid solution of emergency problems. They had an Industrial Research Bureau for long-term problems. If the Emergency Research Bureau survived they would have to decide whether its research results should be published, when those results could be applied by commercial firms, or whether a scheme should be devised whereby the patents would be vested in the State or in the bureau on behalf of the State.

Research conducted at the Battelle Memorial Institute, U.S.A., has shown that iron can be used instead of copper and nickel for printing plates. A solution has been developed which deposits electrolytic iron for normal electrotyping. Ferrous sulphate, ferrous chloride, and ammonium chloride in definite proportions are the essential components. Iron anodes are used, the electrotype mould itself serving as the cathode. The iron can be plated on treated lead moulds or on wax moulds previously oxidised with copper or silvered with a silver spray apparatus.

T.N.T. Waste Problem

Preliminary American Researches

A T.N.T. waste containing the acid wash, an exploratory study of the combined the sulphite or sellite liquor and cooling waters has been carried out by Stuart Schott, C. C. Ruchhoft and Stephen Megregian, of the U.S. Public Health Service. Their experiments are described in an article in *Ind. Eng. Chem.* (1943, *35*, 10, p. 1122), of which a summary is given below.

The waste is characterised by its low *p*H, high colour, and relatively high total solids, sulphates, and oxygen consumed value. The waste interferes with the Winkler method for dissolved oxygen. However, dilutions up to 4-8 per cent., depending upon the strength of the original waste, may be examined for dissolved oxygen by the Rideal-Stewart modification. Although the waste has a considerable oxygen consumed value, no five-day B.O.D. (biochemical oxygen demand) was found. Extended incubation tests indicated no appreciable biochemical demand, from which it was concluded that the principle organic constituents (the nitrotoluene sulphonic acids) were not subject to biochemical breakdown and self-purification in streams. It was found that the wastes interfere with the activated sludge process when present in sewage in concentrations greater than 5 per cent., and with the sprinkling filter in concentrations in sewage of more than 10 per cent.

Experiments on chemical treatment of the waste proved it to be stable and difficult to treat. Neutralisation and precipitation experiments were fruitless, owing to the high solubility of the nitrotoluene sulphonic acids. Fractional distillation produced little organic distillate, and ozonation was ineffective. Activated carbon treatment, although somewhat more effective, requires excessive quantities of carbon and would be prohibitive in cost.

Butyl alcohol was the only solvent of the many tried which successfully extracted considerable organic colour. The method does not appear promising, owing to economic factors of solvent recovery. Electrolytic reduction also proved quite effective in reducing the colour of the waste, but this process also does not appear hopeful economically. Of all the procedures sudied, chlorination or bromination seems most promising. Although bromination is the more effective in reducing colour, economic factors would determine which of the halogens should be used. Further studies on the course of the reaction and the products formed with halogen treatment of the waste need to be made.

Earlier work of these researchers on the same problem was outlined in our report of the April meeting of the American Chemical Society (1943, *48*, p. 648).

An Export Policy

Lord Leverhulme's Free-Trade Plea

"IN the long run, if we do not export, we starve." Such were the opening words of an address by Lord Leverhulme at the recent London Liberal Party Conference on the text: "London's Stake in Overseas Trade."

He went on to state his belief that the future of our overseas trade was going to depend a great deal upon the kind of world in which it would be carried on. Some told us not to worry, that world trade would be planned centrally by an over-riding international authority, that the commodities of the world would be moved about from the country of origin to the country of consumption, much as a chess player moves his pieces. He believed that experience had proved and would prove again that trade flourished only when it flowed freely and when its conduct was left in the vigorous hands of truly free private enterprise. Tariffs and restrictions were always a short-term policy, not recipes for long-term prosperity and widely spread happiness. The United States had thriven because they represented perhaps the largest free-trade area in the world, but the U.S. tariff policy had led her to take gold for exports in such vast quantities that it had become of no use to her. On the adoption by America of a freer trade policy, the future prospects of world trade largely depended.

The Road to Inflation

"Without doubt," he said, "science and technology have enormously increased our capability to produce what the world needs. But the same sort of thing might have been said at the time of the Industrial Revolution. Goods do not flow to countries or individuals because they need them, but because needing them they can pay for them, or in other words give other goods or services for the goods or services they need. To create and distribute 'purchasing power' gratis, simply leads to inflation.

"I do not suggest that the United Nations can proclaim an era of universal free trade immediately after the war, but I believe that an agreement by all nations to reduce their tariffs by an agreed rate per cent. every year, or say every five years, would give time for internal adjustments and furnish such evidences of increasing world prosperity as would prove the policy to be justified. One of the Freedoms in the Atlantic Charter is 'Freedom from Fear.' It will not drop from the skies; we can only obtain it by our own efforts. If we do not export enough goods and services to pay for our necessary imports we shall starve. To the solution of this problem all parties must direct their combined energies."

Parliamentary Topics

Dehydrating Plant

IN the House of Commons last week, Major McCallum asked the Secretary of State for Scotland whether he would cause inquiries to be made into the working of small refrigerating, canning and dehydrating plants recently developed in the United States of America with a view to ascertaining whether similar plants would be suitable for installation on the West Coast of Scotland. Mr. T. Johnston replied that the Scottish Council on Industry had set up a committee to consider the possibilities for the development in Scotland of canning, dehydration, freezing and similar methods of food preservation.

Slag Cement

To Mr. A. Edwards, who asked whether the production of slag cement was cheaper than ordinary cement; whether it was as good in quality; and why it was not more extensively used, Mr. Hicks said he was informed that slag cement was not cheaper; that it was satisfactory for all ordinary purposes; and that its extended use would depend on its advantages as compared with Portland cement.

Portuguese Wolfram

Mr. G. Strauss asked the Parliamentary Secretary to the Ministry of Economic Warfare whether he was aware that Germany was now being deprived of the bulk of her substitutes for wolfram and tin, that the air attacks on the mines in Norway and the advance of the Russians were depriving the Germans of molybdenum and magnesium, and that therefore it seemed all the more essential that Germany should be deprived of wolfram from Portugal at the moment. Mr. Foot recalled his previous answer to the effect that the Government attached great importance to this trade in wolfram, and that the Portuguese Government had been left in no doubt about our views on the subject.

I.G. Subsidiaries

Mr. E. Smith asked the President of the Board of Trade how far the I.G., the I.G. Dyestuffs, and the General Dyestuffs Corporation, New York, were linked up and maintained close commercial, technical and research relations; and whether the General Dyestuffs Corporation exported to Britain after 1939. Mr. Dalton replied that there was, no doubt, before the war, a close relationship between I.G. Farben and all its subsidiary companies. Certain imports into the United Kingdom from the General Dyestuffs Corporation of America were permitted, by special licence, on the ground that they were urgently required for the British war effort. In November, 1939, the majority of the shares in I.G. Dyestuffs, which were found to be held on behalf of I.G. Farben, were vested in the Custodian of Enemy Property and subsequently the company went into liquidation.

British Celanese

In a written reply to Mr. Gallacher, regarding the financial assistance given to the firm of British Celanese by the Government during the period 1941 to 1943 to construct a large plant for manufacturing alcohol from oil, Mr. Peat said that financial assistance had been given to the company in respect of this plant by way of subscription to debenture stock, nearly all of which has since been disposed of through the Stock Exchange in the normal way. With regard to the further question, as to whether the Minister of Supply was satisfied that the results justified continued confidence in the capabilities of the firm, there had been difficulties in obtaining from abroad supplies of the most suitable quality of oil, and it was not yet possible to form a judgment on the results of the plant.

On a later occasion Mr. Gallacher asked the Minister of Production what material licences had been given to British Celanese to proceed with the construction of plant for the manufacture of synthetic rubber; whether this firm had produced specimens of synthetic rubber which justify large scale production; and whether any exchange of information had taken place between this firm and the U.S.A., and the U.S.S.R., with a view to incorporating the best methods as ascertained in practice. Mr. Lyttelton, in reply, stated that the firm had been given licences for such quantities of steel, iron and timber as were necessary for such work as could be undertaken at once. The firm, which had considerable experience of chemical manufacture, was financing the project itself, and was also entirely responsible for the technical side of the work. It was not known to what extent the firm had supplemented its technical knowledge with information obtained from other countries.

Patulin

In a written reply to Col. Evans, who asked what information was available on patulin, and whether the drug was available on a large scale, Miss Horsbrugh referred the inquirer to Professor Raistrick's account in the medical Press. She declared that it would be inadvisable to make patulin generally available until sufficient evidence on its value was forthcoming.

Personal Notes

MR. JOHN C. HANBURY, M.A., B.Pharm., Ph.C., a director of Allen & Hanburys, Ltd., has been elected A.I.C.

SIR JOHN RUSSELL, who is visiting Spain and Portugal on behalf of the British Council, this week arrived in Madrid where he met Franco's Minister of Agriculture.

MR. H. TODD THORNBERY, B.Sc., has been elected president of the National Paint Federation in succession to Mr. S. K. Thornley, who has held this office for the last four years.

The American cellulose chemist, PROFESSOR EDWIN C. JAHN, of Syracuse University, New York, is spending six months in Sweden, studying the scientific development of the cellulose industry in that country.

F/O. HAROLD LACKLAND BEVAN, R.A.F.V.R., who has been awarded the D.F.C., is the son of Councillor A. P. Bevan, chairman of Goodlass Wall & Co., Ltd., Liverpool. Before joining the R.A.F., F/O. Bevan was with his father's firm and for many years was connected with the London office.

Obituary

MR. MARTIN WINNING, formerly works manager to Glenfield & Kennedy, Ltd., London and Kilmarnock, meter makers, hydraulic engineers, etc., died at Kilmarnock on December 4.

MR. JAMES YOUNG, O.B.E., A.R.C.S., F.C.S., formerly Professor of Science, Royal Military Academy, Woolwich, died in London on December 2, predeceasing his wife by one day. The funeral took place on December 7, at the Royal Garrison Church, Woolwich.

Cement at War

Great Achievements Illustrated

OPENING a pictorial exhibition, "Cement in War and Peace," at the Royal Empire Society, London, last week, Mr. Halford W. L. Reddish, chairman of the Cement and Concrete Association, revealed that when war broke out the industry informed the Government that "no matter what the demand might be it was not the desire or intention of the industry to increase its pre-war profits so long as the war lasted."

The exhibition is designed to give some idea—within the limits of security considerations—of the extent to which the work of the association, and the Cement Makers' Federation which created it, have contributed to war and post-war constructional needs, including the development of new uses. Beginning with the country's need for defence after Dunkirk, the exhibition shows how the industry devoted itself to the construction of concrete shelters, protective walling, road blocks, and coastal defence works. Later, concrete was used extensively for the construction of war factories, military camps, huts, roads, and other essential buildings. Next came the demands of wartime housing and 15,000 houses, the majority with concrete roofs, floors and staircases, were built. At the same time, a vast programme of airfield construction was in full swing and hundreds of miles of concrete were used for runways.

Concrete has also met the heavy demands for new farm buildings. In the Fen Districts alone 100 miles of concrete roads enabled more than 50,000 extra acres to be brought into cultivation. All the indications are that, great as has been the industry's contribution to the war effort, it will play an even greater rôle in the immediate post-war years.

Gypsum Building Materials

Fast-Setting Plasters

"GYPSUM Plaster Products" was the title of a lecture by the chief chemist of the British Plaster Board, Ltd., Mr. C. L. Haddon, delivered to the Road and Building Materials Group of the Society of Chemical Industry, on December 2. Mr. Haddon traced the preparation from anhydrite and gypsum of building materials from the time of the Ancient Egyptians to the present day. The figure of 200,000,000 sq. yd. which the lecturer gave for the production of plaster board in North America and Britain indicated the growing importance of these materals. Before the war, 500,000 tons of gypsum were quarried each year in this country, and additional quantities were imported. Plaster-of-Paris consisted of two forms of the so-called "hemihydrate" of calcium sulphate; the β-form, the main product obtained when gypsum is heated in kettles, tends to change at ordinary temperatures into the α-form. It is this latter form which results when gypsum is heated in pans. Mr. Haddon explained how the formation of needle-shaped crystallisation in the setting of the plaster could be reduced by the presence of succinic acid and other substances, and said that by this technique it had been possible to prepare plasters that were stronger than Portland cement. These had found use during the war when machinery had to be installed in a hurry; the fast-setting plasters could be used to produce a bed for the machinery, and they had the advantage of setting far more rapidly than Portland cement. Mr. Haddon referred to the fire-protection qualities of gypsum products; a quantity of water equivalent to a fifth of their weight had to be evaporated before the temperature of the gypsum could rise above 180° C. (quite apart from the heat required to decompose the chemical) and this gave a valuable factor of fire-resistance.

General News

From Week to Week

The Chemical Society's library will be closed on Christmas Day and December 27.

The Institute of Physics has elected fifteen new fellows and thirty-five associates.

Rozalex, Ltd., anti-dermatitis preparation makers, 10 Norfolk Street, Manchester 2, have been elected members of the Manchester Chamber of Commerce.

The Royal Technical College, Glasgow, has admitted 11 new associates in chemistry and 4 in metallurgy. The diplomas in the two subjects number 11 and 2 respectively.

The office and library of the International Society of Leather Trades' Chemists is now at "Craigieburn," Duppas Hill Road, Waddon, Croydon, Surrey. The library can be consulted on Monday to Friday from 10 a.m. to 4 p.m., and 10 a.m. to 12 noon on Saturday.

A north-eastern branch of the Institute of the Plastics Industry has been formed. Mr. W. J. Brown, of South Shields, was elected chairman at the inaugural meeting held in Newcastle last week-end and spoke of the desirability of attracting more factories engaged in plastics manufacture to Tyneside.

The Leeds Joint Council on Industrial Medicine, the first body of its kind in Britain to include representatives of employees in its membership, expresses the view that a six-day week of 55 hours, including overtime, is the optimum practicable working week under existing circumstances.

The development of new industries in Lanarkshire and the Clyde Valley was the subject of a joint conference in London on Thursday between the Secretary of State for Scotland, the Minister of Production, and the Minister of Labour on the one side, and Parliamentary and Local Authority representatives on the other.

A useful Vocational Guide, in booklet form, has been published by Pitman on behalf of the Institute of Export (from whom it may be obtained on application with 1d. stamp). It contains a list of the examining bodies in the various professions, and particulars of the Institute's own course on Education for Export.

Four spellings of the confusing word Atebrin are listed in a paragraph in the October number of *Ind. Eng. Chem.* Both the American and British Chemical Abstracts give the standard version—Atebrin. "Atebrine" is used in Thorpe's Dictionary, "Atabrin" in the Merck Index, and "Atabrine" in the United States Dispensary. The confusion is not reduced by the existence of the synonyms "Mepacrine" and "Quinacrine."

The B.C.I.R.A. Joint Committee on Moulding Sands has been proceeding energetically with its task, and it is expected that recommendations for methods for the testing of all kinds of British sands will be forthcoming. A report, complete to date, has been issued on clays from British sources for use with synthetic sands.

The supplementary grant given by the D.S.I.R. to the British Cast Iron Research Association has been raised from £3500 to £5000, and promises of increased subscriptions amount to another £5000. The number of ordinary and trade members is now 471, 75 more than at the end of the last financial year.

Numerous technical experts spoke at the A.Sc.W. conference in Edinburgh on Saturday last, on "Science and Agriculture," including Dr. A. H. Bunting, of Rothamsted. The forenoon meeting dealt with the organisation of agricultural science services: the afternoon with the application of agricultural research.

The establishment of a Central Statistical Office, to co-ordinate the statistical information of the various Government departments, is the main post-war objective stated in the recent memorandum published by the Royal Statistical Society. To keep such an office supplied with material, every major department should have a statistical branch under the control of an administrative officer.

A special committee of fourteen members has been set up, at the direction of the Secretary of State for Scotland, to investigate the provision, administration and finance of technical education outside the universities and to make recommendations. Communications intended for this special committee should be addressed to the Secretary, Advisory Council on Education in Scotland, St. Andrew's House, Edinburgh.

"**Thousands of people** die each year, millions of working hours are lost, through illnesses directly attributable to smoke and fog. Public opinion is determined that this must be stopped. There is no technical reason for its continuance, and if proper Government action is taken sufficient smokeless fuel and appliances, not only gas and electricity, but solid smokeless fuels burning well in open grates, could within a few years take the place of 40 million tons of raw coal now burnt in our homes." These were among the many hard facts brought out by Mr. Charles Gandy, chairman of the National Smoke Abatement Society in an address on "Town Planning and Clean Air," presented last week to the Town and Country Planning Association.

The existence of vitamin P, which has been contested by some scientists, is confirmed by Dr. Geoffrey H. Bourne, of Oxford, whose results published in *Nature* (1943, 152, p. 659) substantiate the earlier claims of Szent-Györgyi, Zacho and Bacharach. Using guinea pigs, Dr. Bourne produced symptoms of vitamin-P deficiency which proved curable by the administration of citrin.

U.S. trades unionists who have arrived in this country include Mr. Otto Butler, chemical worker at the Monsanto Chemical Co., St. Louis, Missouri, and a member of the American Federation of Labour. Mr. Butler this week told a reporter that he found British men and women more aware of the needs of production in the war effort than their American colleagues. He was also very impressed by the effectiveness of our joint production committees. He has since had a meeting with Mr. Bevin at the Ministry of Labour.

The Trading with the Enemy (Specified Persons) (Amendment) (No. 16) Order, 1943 (S.R. & O. 1943, No. 1632) contains the names of about 150 persons or firms in neutral countries, with whom dealings of any kind are unlawful, and about 200 deletions from the list. Additions include S.A. Fundiciones, Aleaciones, y Metales "Safam," and "Induquímica," both of Buenos Aires. Among the deletions are: Soc. de Industrias Químicas F. Arditti e Cia. ("Sicla"), S. Paulo, and Electro-Metallurgica, Ltda., Bello Horizonte, Brazil.

Notwithstanding repeated appeals to take early delivery of fertilisers, Scots farmers have not responded as it was hoped, so that a serious position has been created in Scotland as regards fertiliser supplies for the spring of 1944. So serious is it that unless the farmers' outlook changes very soon many will have to go without their usual quota, not to mention the extra supplies that are required for the increased acreage. This autumn only about 76 per cent. of last year's tonnage was delivered, and lack of storage has aggravated the situation.

A meeting of over 500 industrial and trade union representatives of local factories, held at the Houldsworth Hall, Manchester, on November 24, heard details of the present coal position explained by Mr. Gordon Macdonald and Mr. F. H. Lucraft, of the Ministry of Fuel. Sir Frederick West, deputy chairman of the regional board, spoke on the relation between production and fuel, and C. T. S. Arnott, Esq., district manager of the Central Electricity Board, dealt with the increase in consumption of electricity. Also present was the chairman of the Fuel Efficiency Committee, Mr. P. D. Kirkman, who declared that further economies in industrial consumption must be made.

Agar-agar is being produced in Eire from native seaweeds by a company called Cold Chon Products.

Thomas De La Rue and Co., Limited, gave a luncheon at the Dorchester on Tuesday to 15 of their employees who have completed 50 years' service with the company. The longest period is that of Mr. Adkins, with 68 years.

Foreign News

Penicillin is being made in Australia at the Adelaide Institute of Medical and Veterinary Science.

Reports state that production of steel in Brazil in 1942 reached 160,000 tons, an increase of 40 per cent. over that for 1939.

Nyasaland's tung oil output in 1942 was double that of the preceding year, and this year's crop is expected to show a further increase of 130 per cent.

Kuwait, Bahrein Islands, and Muscat, all in the Persian Gulf, have been added to the list of countries to which the export of all goods is controlled.

The undermentioned gums and waxes are no longer subject to import restriction into the U.S.A.: gum arabic, ghatti, kadaya, talka, tragacanth and ouricuri.

Bakelite Corporation of Canada, Ltd., has transferred all its assets and business to its affiliated company, Carbide and Carbon Chemicals, Ltd.

Peat-moss output of Canada last year totalled 53,506 short tons, of which 23,927 were sent to the U.S.A. for consumption in the production of magnesium metal.

Germany's power-alcohol production depends to a large extent upon potatoes. It is reported that 40 per cent. of this year's crop will be converted into alcohol.

The annual report of the Swiss Industrial Inspectorate for 1942 records 318 chemical works, with 18,221 workers, as against 295, with 17,606 workers, in 1941.

Chromium compounds, including sodium bichromate and basic chromium sulphate, are to be manufactured in Australia by Chrome Chemicals (Pty.), Ltd., the factory of which is approaching completion.

An output of 1,000,000 barrels a day from the oilfields of Venezuela, double the present production, is forecast by Mr. R. W. Gallagher, President of the Standard Oil Co., of New Jersey, according to Reuter.

The Arendal foundry, in Southern Norway, was put out of action on the night of November 20/21 by uniformed saboteurs, according to the Norwegian-Swedish Press Agency. The foundry, a sister works to the American Union Carbide Company, was engaged in making artificial grinding material for emery machine bands.

Forthcoming Events

The Institution of the Rubber Industry (Manchester section) meets on **December 13,** at 6.15 p.m., at the Engineers' Club, Albert Square, for a discussion on "GR-5 Synthetic Rubber."

At the meeting of the **Institute of Fuel,** in the Central Station Hotel, Newcastle, at 5.15 p.m., on **December 13,** Dr. A. Parker, director of the Fuel Research Station, will lecture on the objects and achievements of the Fuel Research Board.

A meeting of the Agriculture Group, **Society of Chemical Industry,** will be held on **December 14,** at 4 p.m., in the rooms of the Chemical Society, Burlington House, W.1, when a paper on "Livestock Deficiency Diseases and their Treatment" will be presented by Dr S. J. Watson, Director of Research, Jealotts Hill Research Station.

A joint meeting of the **Institution of Chemical Engineers**, the **Chemical Engineering Group,** and the **Institute of Petroleum,** will be held on **December 14,** at 2.30 p.m., in the rooms of the Geological Society, Piccadilly, W.1 Mr. J. G. C. Boot will lecture on "Petroleum as a base Material for Chemical Industry."

Films of chemical interest will be exhibited at the meeting of the **Royal Institute of Chemistry** (Manchester section) to be held on **December 15,** at 6.30 p.m., at Reynolds Hall, College of Technology, Manchester.

A lecture on "Teaching Chemistry at £4000 a Year" will be delivered by Mr. D. Kennedy, at the meeting of the **Royal Institute of Chemistry** (Dublin section), on **December 15, at** 7.30 p.m., in the chemistry department of Trinity College.

The **Institute of Fuel** holds a meeting at James Watt Memorial Institute, Birmingham, at 2.30 p.m., on **December 15,** when Mr. J. Stanley Jones will present a paper entitled "Some Observations on the Use of Low-grade Fuels for Steam Raising."

The fifth group of fuel economy lectures arranged by the **Association of British Chemical Manufacturers** and the **British Chemical Plant Manufacturers' Association** will be given in Manchester, at the College of Technology, at 3.30 p.m., on **December 15.** Non-members should contact Mr. W. Murray, Liverpool Borax Co., Ltd., 6 St. Paul's Square, Liverpool 13. The same papers—"Peak Loads," by Dr. E. G. Ritchie, of the B.C.U.R.A., and "Measuring Instruments," by Mr. H. F. Barnes, of Negretti & Zambra—will be presented in London on January 5.

The Midlands section of the **Society of Chemical Industry** will hold a meeting on **December 16,** at 5.30 p.m., in the Chamber of Commerce, New Street, Birmingham, to hear the following papers: (1) "Comparison of the Molecular Sizes of Proteins and Starches," by Dr. L. F. Wiggins; (2) "The Reaction of Casein with Formaldehyde," by Dr. R. L. Wormell; (3) "The Concentration of Rubber Latex by Creaming with Mucilaginous Substances," by Dr. A. S. Carpenter.

The **Royal Photographic Society** and the **Association for Scientific Photography** hold a joint exhibition of scientific photographic apparatus at 16 Princes Gate, London, S.W.7, on **December 18,** at 2.30 p.m.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BRITISH FERMENTATION PRODUCTS, LTD, London, S.W. (M., 11/12/43).—November 18, charge supplemental to a mortgage and charge dated October 29, 1936, to National Provincial Bank, Ltd.; charged on company's stocks of molasses held from time to time in locked storage tanks at works and premises at Ipswich. *——. April 8, 1942.

Declarations of Solvency Filed

I.C.I. (DYESTUFFS) LTD. (formerly BRITISH DYESTUFFS CORPORATION, LTD.), Slough. (D.S.F., 11/12/43.) November 20.

I.C.I. (FERTILISER & SYNTHETIC PRODUCTS), LTD. (formerly SYNTHETIC AMMONIA & NITRATES, LTD.), Slough. (D.S.F., 11/12/43.) November 20.

I.C.I. (LIME), LTD. (formerly BUXTON LIME FIRMS CO., LTD.), Slough. (D.S.F., 11/12/43.) November 20.

I.C.I. (PAINTS), LTD. (formerly NOBEL CHEMICAL FINISHES, LTD.), Slough. (D.S.F., 11/12/43.) November 20.

Company News

Lightalloys, Ltd., are paying a final dividend of 12½ per cent. (same).

Titanine, Ltd., are paying a 10 per cent. interim dividend (same).

Wailes Dove Bitumastic, Ltd., announce a final dividend of 7½ per cent., making 12½ per cent. for the year (same).

British Alkaloids, Ltd., are maintaining their interim dividends of 12 per cent. (ordinary) and 8 per cent. (preference).

The Anglo-Iranian Oil Co., Ltd., has paid an interim dividend of 5 per cent. (same) on ordinary stock in respect of the year 1943.

The interim ordinary dividend of **Thomas De La Rue & Co., Ltd.**, is maintained at 10 per cent.

Scottish Agricultural Industries, Ltd., report dividends and interest from subsidiary companies, to June 30, £115,636 (£102,886). Ordinary dividend, 6 per cent. (5 per cent.).

The Anglo-Chilean Nitrate Company is making a final payment of 2½ per cent. on its 4½ per cent. debenture stock, totalling 4½ per cent. (same).

The Lautaro Nitrate Company announces a dividend of 5.25 per cent. (5.0714 per cent.) on its "A" and "B" ordinary capital for the year.

Explosives and Chemical Products, Ltd., report a profit to June 30 (after taxation) of £21,467 (£13,530) and are declaring unchanged ordinary (16⅔ per cent.) and deferred (8.024d.) dividends.

Burt, Boulton & Haywood, Ltd., have recorded a net profit, for the year ended June 30, of £18,732 (£16,133). A final ordinary dividend of 3 per cent. is being paid, making 5 per cent. (4 per cent.).

Beechams Pills, Ltd., have declared a second interim dividend, on the deferred shares, of 7½ per cent., for the year to March 31 next, making a total to date of 15 per cent. (14 per cent.).

Chemical and Allied Stocks and Shares

ALTHOUGH there was little business in the industrial and other sections of the Stock Exchange, the undertone was firmer, and values tended to improve. Imperial Chemical rose on balance from 38s. 1½d. to 38s. 7½d., at which the yield is 4½ per cent. on the basis of last year's 8 per cent. dividend. Many leading industrials show yields somewhat below that rate; the small returns reflect continued hopes that after the war there may be scope for improved net profits and dividends. It is realised, however, that this will depend on many factors, particularly the abolition, or material reduction, of E.P.T.

In the case of British Oxygen, which have improved to 77s., the yield is less than 4 per cent. on last year's 15 per cent. dividend. Courtaulds at 50s. 9d. (last year's dividend was 7½ per cent.) yield below 3 per cent.; as do Boots Drug 5s. ordinary at 41s. 6d., last year's distribution in this case having been 24 per cent. For units of the Distillers Co. at 89s. the dividend is 16¼ per cent., and the yield is less than 3¾ per cent., while Dunlop Rubber at 39s. 7½d. return rather more than 4 per cent. on their 8 per cent. dividend. At 34s. 9d. Lever & Unilever yield less than 3 per cent. on last year's 5 per cent. dividend. Elsewhere, Babcock & Wilcox yield 4⅜ per cent., British Match 4½ per cent., Goodlass Wall 4⅜ per cent., and Tube Investments nearly 4½ per cent.

In the iron and steel section yields are on a higher basis, reflecting prevailing market uncertainty as to the post-war outlook for heavy industries. Allied Ironfounders, for example, yield fully 5¼ per cent., United Steel over 6½ per cent., and Baldwins more than 6⅔ per cent. As in industrial shares generally, the tendency among those of companies connected with the chemical and allied industries is for them to be valued, not so much on the basis of current dividends, as on prevailing views of the dividend outlook for the post-war period.

B. Laporte were lower at 75s., and W. J. Bush were again 60s. Greeff-Chemicals 5s. ordinary were 7s. 3d. Elsewhere, Turner & Newall further improved from 75s. 9d. to 76s. 6d., awaiting publication of the financial results. De La Rue were little changed at 158s. 9d., although more than the maintenance of the interim dividend at 10 per cent. had been expected in some quarters. British Industrial Plastics 2s. ordinary were 6s. 7½d., and Erinoid 5s. shares again 10s. 6d. At 35s. 9d. Borax Consolidated were unchanged on balance, and British Aluminium at 47s. 3d. were also the same as a week ago. An improvement from 62s. 6d. to 63s. was recorded in Associated Cement. Wall Paper Manufacturers deferred were better at 39s. Triplex Glass 10s. ordinary were 37s., and British Plaster Board 28s. Following publication of the financial results, Burt Boulton improved to 21s. Cooper McDougall ordinary changed hands up to 28s. 6d., and Fisons at 47s. 6d. At 24s. British Drug Houses were the same as a week ago, while Monsanto Chemicals 5½ per cent. preference remained at 23s. 6d. Goodlass Wall 10s. ordinary had a firmer appearance at 15s. 10½d. Lewis Berger were firm at 92s. 6d., awaiting the dividend announcement. Lawes Chemical 10s. shares were 13s., and Cellon 5s. ordinary again 23s. British Glues 4s. ordinary changed hands at 7s. 9d. Minor fluctuations were shown in British Celanese, which, however, recorded on balance an improvement from 27s. 4½d. to 28s. 9d. In other directions, Stewarts & Lloyds were 9d. better at 51s. 3d., and Dorman Long strengthened to 28s. 3d., while Richard Thomas 6s. 8d. ordinary improved to 9s. 10½d. Moreover, at the time of writing, Barry & Staines have further improved from 43s. to 43s. 6d. Nairn & Greenwich were better at 65s. 7½d. Among oil shares, Anglo-Iranian eased, but Shell and Burmah Oil recorded small gains on balance.

Prices of British Chemical Products

STEADY activity has been reported from most sections of the London industrial chemicals market during the past week and a moderate weight of fresh contract buying has taken place. Deliveries to consumers under existing commitments have been maintained on a good scale and, taking the market as a whole, there is a ready outlet for all available supplies. No price alterations have been notified and values generally are steady at recent levels, with the undertone firm. Demand for both the potash and soda products continues along steady lines, with a number of items available for priority purposes only. Elsewhere, the position remains much the same as reported in recent weeks. Trade in the coal-tar products section has been fairly brisk, with contract supplies absorbed steadily. Pitch is enjoying a good call and the price position is maintained. A good demand is reported for the xylols, toluols, and benzols.

MANCHESTER.—Stocktaking and other seasonal factors may be expected to reduce pressure for supplies of heavy chemical products on the Manchester market during the next few weeks. So far, however, there has been little sign of this development and since last report fairly steady trading conditions have been recorded on this centre, both in respect of contract deliveries and as regards the volume of new business. Most of the alkalis and other leading chemicals are finding a reasonably good outlet, and prices all round are on a very firm basis. With regard to the by-products, active conditions are reported so far as the actual movement into consumption is reported, with values of most classes now on a controlled basis.

GLASGOW.—In the Scottish heavy chemical trade business has been rather quiet during the past week both for home and export business. Prices remain very firm at previous levels.

Price Changes

Rises: Pitch.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton £39 10s.; 10 cwt./ 1 ton, £40 10s., 4/10 cwt., £41 10s.; 80% pure, 1 ton, £41 10s.; 10 cwt./1 ton, £42 10s.; 4/10 cwt., £43 10s.; commercial glacial, 1 ton, £49; 10 cwt./1 ton, £50; 4/10 cwt., £51; delivered buyers' premises in returnable barrels, £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £65; 10/50 tons, £65 10s.; 5/10 tons, £66; 1/5 tons, £66 10s.; single drums, £67 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r.

Aluminium Sulphate.—£11 10s. to £11 15s. per ton d/d.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Carbonate.—£38 per ton d/d in 5 cwt. casks.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £19 10s. per ton. See also Salammoniac.

Antimony Oxide.—£111 to £117 per ton.

Arsenic.—For 1-ton lots, £42 to £45 per ton, according to quality, ex store. Intermediate prices for intervening quantities.

Barium Carbonate.—MANCHESTER: precip., 4-ton lots, £16 per ton d/d; 2-ton lots, £16 5s. per ton.

Barium Chloride.—98/100%, prime white crystals, £16 10s. to £19 10s. per ton, bag packing, ex works.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax, Commercial.—Granulated, £31 10s.; crystals, £32 10s.; powdered, £33; extra fine powder, £34; B.P. crystals £40 10s.; powdered, £41; extra fine, £42 per ton for ton-lots, in free 1-cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £83; powder, £84 per ton in tin-lined cases for home trade only, packages free, carriage paid.

Boric Acid.—Commercial, granulated, £52 15s.; crystals, £53 15s.; powdered, £54 15s.; extra fine powder, £56 15s.; B.P. crystals, £61 15s.; powdered, £62 15s.; extra fine powdered, £64 15s. per ton for ton lots in free 1-cwt. bags, carriage paid in Great Britain.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£10 10s. to £14 per ton, ex wharf. Granulated, supplies scarce.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5½d. per lb.

Chromic Acid.—1s. 5d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Oxide.—Black, powdered, about £100 per ton.

Copper Sulphate.—£31 10s. per ton, f.o.b., less 2 per cent. in 2 cwt. bags.

Cream of Tartar.—£100%, £13 2s. per cwt., less 2½%, d/d in sellers' returnable casks.

Formaldehyde.—£25 to £26 10s. per ton in casks, according to quantity, d/d.

Formic Acid.—85%, £47 per ton for ton lots, carriage paid; smaller parcels quoted up to 50s. per cwt., ex store.

Glycerine.—Chemically pure, double distilled 1260 s.g., in tins, £4 to £5 per cwt., according to quantity; in drums, £3 19s. 6d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 11d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Lactic Acid.—Pale tech., £49 per ton; dark tech., 43½% by weight, £42 per ton ex works; barrels returnable carriage paid.

Lead Acetate.—White, 50s. 6d. to 52s. 6d. per cwt. MANCHESTER: £51 to £54 per ton.

Lead Nitrate.—About £47 per ton d/d in casks.

Lead, Red.—English, 5/10 cwt., £44 10s. per ton; 10 cwt. to 1 ton, £44 5s.; 1/2 tons, £44; 2/5 tons, £43 10s.; 5/20 tons, £43; 20/100 tons, £42 10s.; over 100 tons, £42 per ton, less 2½%, carriage paid, non-setting red lead, 10s. per ton dearer in each case.

Lead, White.—Dry English, less than 5 tons, £57; 5/15 tons, £53; 15/25 tons, £52 10s.; 25/50 tons, £52; 50/200 tons, £51 10s. per ton; less 5%, carriage paid. Ground in oil, English, 1/5 cwt., £69; 5/10 cwt., £68; 10 cwt. to 1 ton, £67 10s.; 1/2 tons, £66; 2/5 tons, £65; 5/10 tons., £63; 10/15 tons, £62; 15/25 tons, £61; 50/100 tons, £60 10s. per ton, less 5% carriage paid.

Litharge.—1 to 2 tons, £44 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 15s. to £22 15s. per ton.

Magnesium Chloride.—Solid (ex wharf), £16 to £18 per ton. MANCHESTER: £15 to £17 per ton.

Magnesium Sulphate.—Nominal.

Mercury Products.—Controlled price for 1-cwt. quantities: Bichloride powder, 15s. 8d.; bichloride lump, 16s. 8d.; mercury oxide, red cryst., 20s. 9d.; red levig., 20s. 3d.; red tech., 19s. 11d.; yellow levig., 20s. 2d.; yellow tech., 19s. 7d.; sulphide, red, 17s. 9d.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 2s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 2s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£60 to £65 per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.

Paraffin Wax.—Nominal.

Potash, Caustic.—Basic price for 50-100 ton lots. Solid, 88/92%, commercial grade, £55 7s. 6d. per ton, c.i.f. U.K. port, duty paid. Broken, £5 extra; flake, £7 10s. extra; powder, £10 extra per ton. Spot delivery, ex store, £3 10s. per ton extra. Liquid, d/d, £34 in lots of 1 ton.

Potassium Bichromate. — Crystals and granular, 7¾d. per lb.; ground, 8¾d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Basic price for 50 to 100 ton lots; calcined, 98/100%, £66 15s. to £68 5s. per ton ex store. Smaller quantities subject to additions to basic price. Spot delivery ex warehouse £3 10s. per ton extra.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 10d. per lb. for 1 cwt. lots; for 3 cwt. and upwards, 1s. 9½d. per lb.; technical, £7 18s. 6d. to £8 10s. 6d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, 5 cwt. to 7 cwt., casks, 1s. 6d. per lb., d/d; supplies scarce.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £19 10s. per ton, in casks, ex store.

Soda, Caustic. — Solid 76/77%; spot, £16 7s. 6d. per ton d/d station.

Sodium Acetate.—£41 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 6½d. per lb.; anhydrous, 6¾d. per lb., net, d/d U.K.

Sodium Bisulphite Powder.—60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£21 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£36 to £42 per ton, nominal.

Sodium Hyposulphite.—Pea crystals, £21 10s. per ton for 2-ton lots; commercial, £15 per ton.

Sodium Iodide.—B.P., for not less than 28 lb., 9s. 11d. per lb., for not less than 7 lb., 13s. 1d. per lb.

Sodium Metasilicate.—£16 per ton, d/d U.K. in 1-ton lots.

Sodium Nitrite.—£20 to £23 10s. per ton for ton lots.

Sodium Percarbonate.—21½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £25 to £28 10s. per ton d/d for ton lots. Tri-sodium, £26 to £30 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salts).—£4 10s. ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £18 5s. per ton, d/d, in drums; crystals, 30/32%, £12 7s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton, for quantities of not less than 4 tons; ground, but not sieved, £15 10s.; ground and sieved, £17 15s. Controlled prices.

Sulphuric Acid.—168° Tw., £6 10s. to £7 10s. per ton; 140° Tw., arsenic-free, £4 11s. per ton; 140° Tw., arsenious, £4 3s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—3s. 1½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards.

Tin Oxide.—Snow-white, controlled material, about 330s. per cwt.; free (nominal), 400s.-500s. per cwt.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £34; green seal, £33; red seal, £31 10s.

Zinc Sulphate.—Tech., £20-£21 per ton, carriage paid, casks free.

Rubber Chemicals

Antimony Sulphide.—Golden, 1s. 2d. to 2s. 1½d. per lb. Crimson, 2s. 2d. to 2s. 6d. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Bisulphide.—£34 per ton, according to quality, in free returnable drums.

Carbon Tetrachloride.—£44 to £49 per ton, according to quantity.

Chromium Oxide.—Green, 2s ped lb.

India-rubber Substitutes.—White, 6 3/16d. to 10¼d. per lb.; dark, 6 3/16d. to 6 15/16d. per lb.

Lithopone.—30%, £25 per ton; 60%, £31 to £32 per ton. Imported material would be dearer.

Mineral, Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.
Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosporic acid, per ton d/d farmer's nearest station, in November, £20 5s. Increased charge of 2s. 6d. per month up to March, 1944.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, November, £9 16s.; increased charge of 1s. 6d. per month up to March, 1944.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, in November I.C.I. type "Special No. 1," £14 11s. 6d. Increased charge of 2s. 6d. per month up to March, 1944. Type "Special No. 2," none available until January, 1944.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £15 6s. per ton; granulated, over 98%, £14 10s per ton. None available until January, 1944.

Coal Tar Products

Benzol.—Crude, 60's, 1s. 11d.; pure, 2s. 6d., per gal., ex works.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. to 4s. 6d., according to specification. MANCHESTER: Crystals, 9¾d. to 11½d. per lb., d/d; crude, 4s. o 4s. 6d., naked, at works.

Creosote.—Home trade, 6½d. to 7d. per gal., f.o.r., maker's works. MANCHESTER: 6½d. to 9d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. MANCHESTER: Pale, 99/100%, 4s. 6d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 8d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 2d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £5 9s. to £8 9s. per ton, according to m.p.; hot-pressed, £10 5s. per ton, in bulk ex works; purified crystals, £19 to £35 per ton. Controlled prices.

Pitch.—Madium, soft, 50s. to 64s. per ton, f.o.b. MANCHESTER: 46s. per ton, at works.

Pyridine.—90/140°, 18s. to 18s. 6d. per gal.; 90/160°, 14s. MANCHESTER: 14s. to 18s. 6d. per gal.

Toluol.—Pure, 2s. 7½d. nominal; 90's, 1s. 11d. per gal. MANCHESTER: Pure, 2s. 7½d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 1½d. to 3s. 4d. per gal., according to grade, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Wood Distillation Products

Calcium Acetate.—Brown, £21 per ton; grey, £24. MANCHESTER: Grey, £24 to £25 per ton.

Methyl Acetone.—40/50%, £56 per ton.

Wood Creosote.—Unrefined, about 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. per gal.

Wood Tar.—£5 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—December 8.—For the period ending January 1 (January 8 for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package: LINSEED OIL, crude, £50. RAPESEED OIL, crude, £60. COTTONSEED OIL, crude, £52 2s. 6d.; washed, £55 5s.; refined edible, £57; refined deodorised, £58. COCONUT OIL, crude, £49; refined deodorised, £49; refined hardened deodorised, £53. PALM KERNEL OIL, crude, £48 10s.; refined deodorised, £49; refined hardened deodorised, £53. PALM OIL, refined deodorised, £55; refined hardened deodorised, £58. GROUNDNUT OIL, crude, £56 10s.; refined deodorised, £58; refined hardened deodorised, £62 to £63. WHALE OIL, crude hardened, 42 deg., £51 10s.; refined hardened, 46/48 deg., £52 10s. ACID OILS: Groundnut, £40; soya, £38; coconut, and palm-kernel, £43 10s. ROSIN, 30s. 6d. to 45s. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (comtrolled price).

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Barytes Substitute	Lead Nitrate	Rubber Accelerators	Talc
Carbonate of Potash	Manganese Borate	Sodium Acetate	Temperature Indicating Paints and Crayons
Caustic Potash (all grades)	Methyl Cellulose	Sodium Bichromate	Thio Urea
Cellulose Adhesives	Methylene Chloride	Sodium Chlorate	Urea
Coumarone Resin	Oxalic Acid and Salts	Sodium Nitrate	Wax Substitutes
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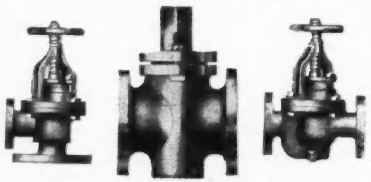

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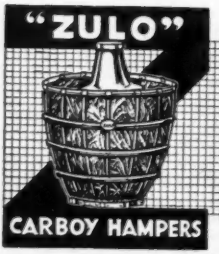

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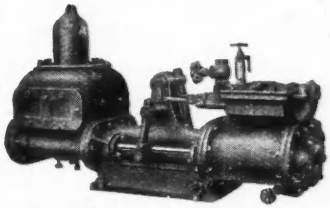

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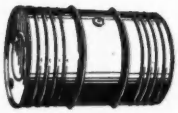

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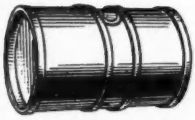

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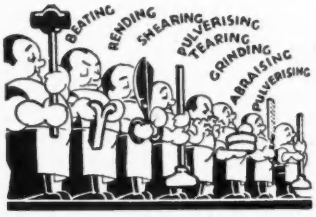

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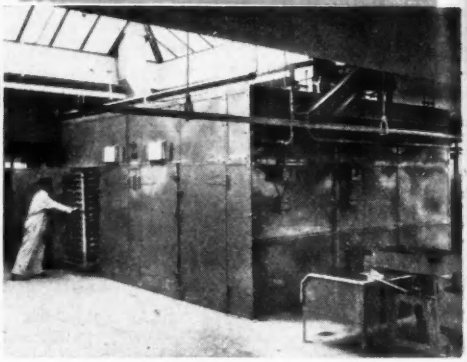

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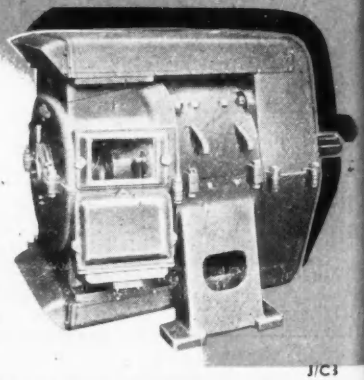

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